

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

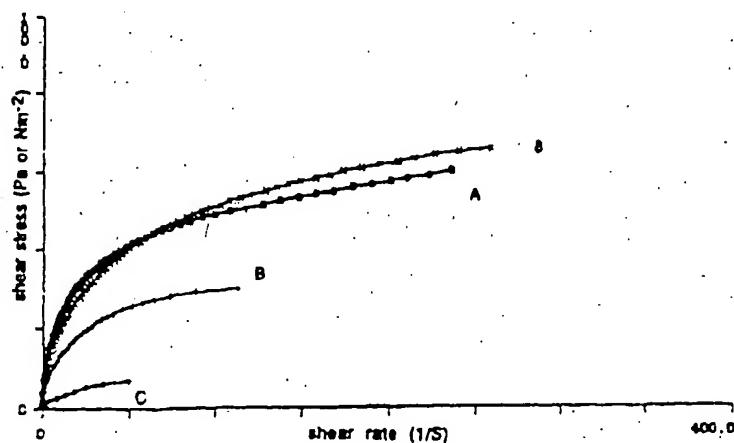
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A61K 7/075, B01F 17/28		A1	(11) International Publication Number: WO 96/19188
			(43) International Publication Date: 27 June 1996 (27.06.96)
(21) International Application Number: PCT/US95/16050		(81) Designated States: AU, BR, CA, CN, JP, KR, MX, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 12 December 1995 (12.12.95)			
(30) Priority Data: PN 0153 20 December 1994 (20.12.94) AU		Published With international search report.	
(71) Applicant (for all designated States except US): THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).			
(72) Inventor; and (75) Inventor/Applicant (for US only): NAMBU, Takanori [JP/JP]; 3-20-903, Morigo-cho 2-chome, Nada-ku, Kobe 657 (JP).			
(74) Agents: REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).			

(54) Title: FOAMING AGENT FOR FOAMING COSMETIC COMPOSITIONS

(57) Abstract

A foaming agent comprising an amphoteric surfactant and an N-acylamino acid surfactant which foams by being dispersed or sprayed, and provides improved foaming characteristics to foaming cosmetic compositions. In one preferred embodiment of the present invention, the foaming agent is comprised in a foaming cosmetic composition such as a hair mousse composition comprising a solvent and optical compositions such as polymer, preservative and propellant. As shown in the figure, foaming composition (8) of the present invention containing cocamidopropyl betaine and sodium lauroyl sarcosinate shows similar rheology to comparative example (A) and better foam rheology compared to comparative examples (B) and (C).



B: 0.6% Cocamidopropyl Betaine and 0.05% Sodium Cocoyl Sarcosinate (present invention).

A: 0.2% Cocamidopropyl Betaine and 0.2% Lauramine Oxide

B: 0.6% Cocamidopropyl Betaine

C: 0.05% sodium Cocoyl Sarcosinate

BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

FOAMING AGENT FOR FOAMING COSMETIC COMPOSITIONS

TECHNICAL FIELD

The present invention relates to a foaming agent comprising an amphoteric surfactant and an N-acylamino acid surfactant which provides voluminous and stable foaming, and smooth and mild touch to foaming cosmetic compositions. In particular, the present invention relates to leave-on hair mousse products comprising this foaming agent.

BACKGROUND

Cosmetic compositions such as shaving creams, hair mousses, spray foams, foaming lotions and foaming creams are aimed to be dispensed or sprayed as foams and applied on the human skin or hair. These products are described in the present invention as "leave-on foaming cosmetic products". One common characteristic desired for these leave-on foaming cosmetic products is a foam having favorable characteristics to the consumer such as voluminous and stable foaming, with smooth and mild touch to the skin and hair.

Leave-on foaming cosmetic compositions for hair are usually referred to as "mousses", which term will be used in the present invention. Hair mousses were born in Europe in the early 1980s. Hair mousses are fundamentally an aerosol foam, however, non-aerosol foams are also known. The general appeal of hair mousses can be largely attributed to the ease of application and controlled amount of product which are possible from mousse formulations. Hair mousse compositions are generally dispensed by a compressible dispenser or a valve and applied to the user's hand or a specifically designed comb and spread through the hair. Alternatively, hair mousse compositions can be directly applied to the hair by dispensing through nozzles. Hair mousses are formulated for the purpose of styling, setting, and arranging, or for other purposes such as shampooing, conditioning, treating, dyeing, and combinations thereof.

In recent years, some consumers have expressed a desire to have "alcohol-free" hair mousse products because of concerns relating to drying of the hair, or concerns of volatile solvents being emitted to the environment. In this context, alcohol refers to volatile primary alcohols having about 1 to 6 carbons, particularly ethanol. Alcohol is used in mousses for a number of reasons. First, the presence of volatile alcohol can aid styling by decreasing drying time. However, it is assumed that this drying has raised the concerns of some consumers that alcohol is also drying hair. Second, alcohol aids foam breakage as the mousse is spread throughout the hair. It is known that foam breakage is a result of the ability of alcohol to act as a defoaming agent. Third, alcohol itself improves product

ability of alcohol to act as a defoaming agent. Third, alcohol itself improves product preservation. Fourth, alcohol enhances the compatibility of the concentrate with the propellant, and acts as a solubility bridge between the resin and the water base. Fifth, alcohol is a good solvent for dissolving oil base ingredients such as conditioning fatty alcohols. Consequently, elimination of alcohol from the formulation may affect product performance. Thus, there is a desire to provide a foaming agent which can be used in hair mousse compositions with or without alcohol.

The species and level of preservatives are also known to affect product performance. Preservatives such as DMDM Hydantoin (dimethylol dimethyl hydantoin) and Kathon CG (mixture of methylchloro-isothiazolinone and methyl isothiazolinone) are known as effective preservatives at low levels, however, are not approved for use in leave-on cosmetic products in a number of countries. Phenoxyethanol and EDTA are widely accepted for use, however, are not satisfactorily effective at low levels. Parabens such as methyl paraben, propyl paraben, butyl paraben, and LiquaPar oil (mixture of isobutyl paraben, isopropyl paraben, and butyl paraben) are also widely accepted for use. However, because parabens are lipophilic, they cannot dissolve in water, and thus have some formulation constraints. Methyl paraben and propyl paraben are difficult to formulate at high levels, for they are solid at room temperature. Thus, there is also a desire to provide a foaming agent which can be used in hair mousse compositions in combination with a wide range of preservatives.

The type of propellants are also known to affect product performance. It is known that fluorohydrocarbons such as difluoroethane 152a (supplied by DuPont) can be used for a wide range of formulations. Propane and dimethyl ether can also be used for a wide range of formulations. However, propane is relatively combustible. Dimethyl ether when used at high levels can be corrosive. LPG (liquefied petroleum gas) is a mixture of mainly iso-butane, n-butane, and propane, and is available in different pressure grades. LPG is a relatively safe propellant, however, have some formulation constraints. Thus, there is also a desire to provide a foaming agent which can be used in hair mousse compositions in combination with a wide range of propellants.

Evaluation of product performance for hair mousse compositions vary depending on the purpose and concept of the product. In evaluating the performance of a hair mousse, one generally considers properties seen in three major stages; the properties of the foam upon dispensing from the package, the properties of the foam upon applying to the hair, and properties of the end results to the hair. Properties considered upon dispensing include volume of foam and foam expansion speed. It is known that when foam expansion is slow or delayed, "pooling" of the product occurs. Properties considered upon applying to the hair include stability and breakability of the foam, non-soapiness,

smoothness, softness, creaminess, and stickiness. Properties considered on the end results to the hair include style control, dry or wet feel of hair, washability, shine, moisturizing, conditioning, anti-static, and brushing.

An attempt to achieve the above requirement, co-pending, commonly-assigned
5 U.S. application serial number 08/154,231 (Y. Chen and T. Nambu) filed November 18, 1993 discloses a foaming agent for leave-on foaming cosmetic composition comprising an amphoteric surfactant and an amine oxide.

However there remains a need for foaming cosmetic compositions having improved foaming characteristics.

10

OBJECT OF THE INVENTION

It is an object of the present invention to provide a foaming agent which foams by being dispensed or sprayed, and provides voluminous and stable foaming, smooth and mild touch, and styling/conditioning effect to foaming cosmetic compositions.

15

It is also an object of the present invention to provide a foaming cosmetic composition such as a hair mousse composition comprising said foaming agent which provides a foam having appropriate foam breakdown (foam breakability) under shear and is easy to spread on hair, has a smooth, soft and creamy texture, and has a mild touch.

It is further an object of the present invention to provide a foaming cosmetic
20 composition such as a hair mousse composition comprising said foaming agent which can be formulated in combination with a wide range of solvents, preservatives, and propellants.

It is further an object of the present invention to provide a foaming cosmetic composition such as a hair mousse composition comprising said foaming agent which provides quick, voluminous foam expansion and reduced pooling upon dispensing.

25

It is further an object of the present invention to provide a hair mousse composition comprising said foaming agent which provides good style control, conditioning effect, and good feel to the hair.

BRIEF DESCRIPTION OF THE DRAWING

30

Fig.1 shows the foam rheology, of a composition of the present invention and of comparative compositions.

SUMMARY OF THE INVENTION

The present invention relates to a foaming agent comprising an amphoteric
35 surfactant and an N-acylamino acid surfactant which foams by being dispensed or sprayed, and provides improved foaming characteristics to foaming cosmetic compositions.

The present invention also relates to a foaming cosmetic composition such as a hair mousse composition comprising the foaming agent and further comprising a solvent and a propellant. In a particularly preferred embodiment of the present invention, the hair mousse composition comprises the foaming agent which comprises amphoteric surfactant and an N-acylamino acid surfactant at a weight ratio of 15:85 to 99:1 and further comprises a polymer, a solvent, a preservative, and a propellant.

DETAIL DESCRIPTION OF THE INVENTION

The present invention relates to a foaming agent for use in a foaming cosmetic composition which foams by being dispensed or sprayed, comprising an amphoteric surfactant and an N-acylamino acid anionic surfactant and salts thereof.

The present invention also relates to a foaming composition such as a hair mousse composition comprising the foaming agent and further comprising a solvent and a propellant.

All percentages and ratios are based on weight unless otherwise specified. The total of components except for propellant is defined as a concentrate. For non-aerosol products containing no propellant, the concentrate is equal to the entire composition.

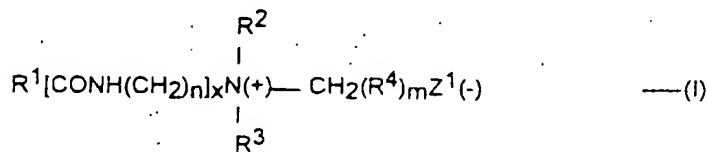
FOAMING AGENT

The foaming agent of the present invention comprises an amphoteric surfactant and an N-acylamino acid surfactant and salts thereof.

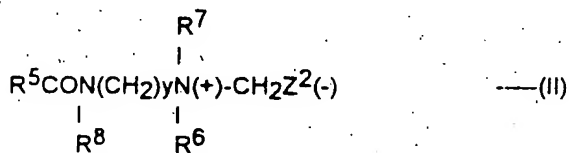
When comprised in foaming cosmetic compositions, such as hair mousses, the foaming agent of the present invention preferably comprises the amphoteric surfactant and the N-acylamino acid surfactant at a ratio of 15:85 to 99:1, more preferably 25:75 to 99:1, and typically comprising 50%-100% by weight of the combination of the amphoteric surfactant and the N-acylamino acid surfactant. Other components of a foaming agent and include solvents such as water, lower alcohol, polyhydric alcohols, and mixture thereof.

Amphoteric Surfactant

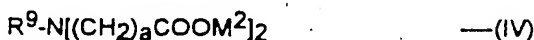
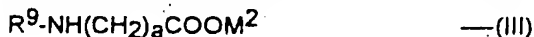
Amphoteric surfactants useful in the present invention are those having the following general formulae (I) (II), (III) and (IV) and mixtures thereof:



wherein R^1 is an alkyl, alkenyl, aryl, or hydroxyalkyl radical of from about 8 to about 22 carbon atoms, optionally interrupted with up to about 10 ethylene oxide moieties and/or 1 glyceryl moiety, R^2 and R^3 are individually selected from alkyl and monohydroxyalkyl groups containing from about 1 to about 3 carbon atoms, R^4 is alkylene, or hydroxyalkylene of from about 1 to about 4 carbon atoms, Z^1 is a radical selected from carboxylate, sulfonate, sulfate, phosphate, or phosphonate, x is 0 or 1, n is from about 1 to about 6, and m is 0 or 1. Preferably, R^1 is an alkyl, alkenyl, or hydroxyalkyl radical of from 11 to 17 carbon atoms, R^2 and R^3 are individually selected from alkyl groups containing of from 1 to 3 carbon atoms, R^4 is alkylene or hydroxyalkylene of from 1 to 2 carbon atoms, Z^1 is a radical selected from carboxylate, sulfonate, x is 0 or 1, n is 1 to 3, and m is 0 or 1.



wherein R^5 is C₈-C₂₂ alkyl, alkenyl, aryl, or hydroxyalkyl, preferably C₈-C₂₂, R^6 is hydrogen or CH₂CO₂M¹, R^7 is CH₂CH₂OH or CH₂CH₂OCH₂CH₂COOM¹, R^8 is hydrogen, CH₂CH₂OH, or CH₂CH₂OCH₂CH₂COOM¹, Z^2 is CO₂M¹ or CH₂CO₂M¹, y is 2 or 3, preferably 2, M¹ is hydrogen or a cation, such as alkali metal, alkaline earth metal, ammonium, alkanol ammonium, sulfate, sulfonate, phosphate, or phosphonate.



wherein a is a number from 1 to 4, R^9 is C₈-C₂₂ alkyl, alkenyl, aryl, hydroxyalkyl or alkylamidoalkyls, and M² is hydrogen, alkali metal, alkaline earth metal, ammonium or alkanolammonium.

Examples of amphoteric surfactants useful for hair mousse compositions having general formula (I) are amide betaines, amide sulfo betaines, alkyl betaines, alkenyl betaines, sultaines (sulfo betaines), and imidazolinium betaines. Examples of amphoteric surfactants particularly useful for hair mousse compositions are high alkyl betaines, such as coco dimethyl carboxymethyl betaine, cocamidopropyl betaine under the trade name of TEGO BETAINE, coco betaine, lauryl betaine under the trade name REWOTERIC AM DML-35, lauryl amidopropyl betaine, oleyl betaine, lauryl dimethyl carboxymethyl betaine, lauryl dimethyl alpha-carboxyethyl betaine, cetyl dimethyl carboxymethyl betaine, lauryl bis-(2-hydroxyethyl) carboxymethyl betaine, stearyl bis-(2-hydroxypropyl) carboxymethyl betaine, oleyl dimethyl gamma-carboxypropyl betaine, lauryl bis-(2-hydroxypropyl) alpha-carboxyethyl betaine, cocamidopropyl hydroxy sultaine (sulfobetaine), lauryl sultaine (lauryl sulfobetaine), and cocamidopropyl hydroxy sultaine under the trade name REWOTERIC AM CAS.

Examples of amphoteric surfactants useful for hair mousse compositions having general formula (II) are marketed under the trade name MIRANOL and are understood to comprise a complex mixture of species, and can exist in protonated and non-protonated species depending upon pH with respect to species that can have a hydrogen at R⁶. The imidazolinium amphoteric surfactant hereof can be derived via an imidazolinium intermediate.

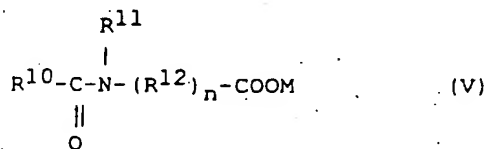
Preferred amphoteric surfactants of formula (II) are monocarboxylates and dicarboxylates. Examples of these materials include cocoamphocarboxypropionate, cocoamphocarboxypropionic acid, cocoamphocarboxyglycinate (alternately referred to as cocoamphodiacetate), and cocoamphoacetate.

Specific commercial products providing the imidazolinium derivative component of the present compositions include those sold under the trade names MIRANOL C2M CONC. N.P., MIRANOL C2M CONC. O.P., MIRANOL C2M SF, MIRANOL CM SPECIAL (Miranol, Inc.); ALKATERIC 2CIP (Alkanil Chemicals); cocoamphocarboxy propionate under the trade name NIKKOL AM-101, AMPHOTERGE W-2 (Lonza, Inc.); MONATERIC CDX-38, MONATERIC CSH-32 (Mona Industries); REWOTERIC AM-2C (Rewo Chemical Group); and SCHEROTERIC MS-2 (Scher Chemicals).

Examples of amphoteric surfactants useful for hair mousse compositions having general formulae (III) and (IV) include n-alkylaminopropionates and n-alkyliminodipropionates. Such materials are sold under the trade name DERIPHAT by Henkel and MIRATAINE by Miranol, Inc. Specific examples include N-lauryl-beta-amino propionic acid or salts thereof, and N-lauryl-beta-imino-dipropionic acid or salts thereof.

N-Acylamino Acid Surfactant

N-acyl amino acid surfactants, for purposes hereof, include N-acyl hydrocarbyl acids and salts thereof, such as those represented by Formula (V), as follows:



wherein: R¹⁰ is a C₈-C₂₄ alkyl or alkenyl radical, preferably C₁₀-C₁₈ alkyl; R¹¹ is -H, C₁-C₄ alkyl, phenyl, or -CH₂COOM, preferably C₁-C₄ alkyl, more preferably C₁-C₂ alkyl; R¹² is -CR¹³₂- or C₁-C₂ alkoxy, wherein each R¹³ independently is -H or C₁-C₆ alkyl or alkylester, and n is from 1 to 4, preferably 1 or 2; and M is -H or a soluble salt-forming cation such as ammonium, alkanolamine, such triethanolamine, monovalent metals, such as sodium and potassium, and polyvalent metal cations, such as magnesium and calcium, preferably an alkali metal such as sodium or potassium.

A wide variety of N-acyl acid surfactants and their synthesis are described in *Anionic Surfactants, Part II, Surfactant Science Series, Vol. VII*, edited by Warner M. Linfield, Marcel Dekker, Inc. (New York and Basel), 1976; pp 581-617.

Especially preferred are compounds of Formula (V) wherein R¹¹ is methyl and R¹² is -CH₂-, and n is 1 or 2, which are known as the N-acyl sarcosinates, propionates and acids thereof. Specific examples include lauroyl sarcosinate, myristoyl sarcosinate, cocoyl sarcosinate, oleoyl sarcosinate, lauroyl methyl aminopropionate, and cocoyl methyl aminopropionate preferably in their sodium and potassium salt forms.

For the purposes of the surfactants described herein, it should be understood that the terms "alkyl" or "alkenyl" include mixtures of radicals which may contain one or more intermediate linkages such as ether or polyether linkages or non-functional substituents such as hydroxyl or halogen radicals wherein the radical remains of hydrophobic character.

FOAMING COSMETIC COMPOSITIONS

A foaming cosmetic composition of the present invention comprises a concentrate which is a foamable liquid which produces a foam when mixed an external source of air or gas, and is dispensed as a foam.

A concentrate (by weight) of the foaming cosmetic composition of the present invention comprises 0.01-20%, more preferably 0.01-10%, most preferably 0.01-6%, of the foaming agent.

The concentrate (by weight) of the foaming cosmetic composition of the present invention comprises from about 0.005% to 5%, preferably from about 0.01% to about 3%, of amphoteric surfactant, and comprise from about 0.005% to about 5%, preferably from about 0.01% to about 3% of N-acyl amino acid surfactant as the foaming agent of the present invention.

Solvent

The foaming cosmetic compositions further preferably comprises a solvent for the foaming agent. Solvents used in a foaming cosmetic composition of the present invention are selected depending on variables such as the remainder components, viscosity, and desired foaming characteristic of the composition.

When comprised in hair mousses, the solvent is preferably comprised at a level of 60-99%, more preferably 80-99%, most preferably 85-98% of the concentrate.

Non-limiting examples of solvents useful in the present invention are: water, lower alcohols having 1 to 6 carbons such as ethanol and isopropanol, and polyhydric alcohols such as propylene glycol, hexylene glycol, glycerin, and propane diol, and mixtures thereof.

Propellant

The foaming cosmetic compositions further preferably comprises a propellant so mixing with the concentrate to foam the foam.

Propellants when used in a foaming cosmetic composition in the present invention are selected depending on variables such as the remainder components, the package, and how the product is designed to be used (standing or invert).

When comprised in hair mousses, the propellant is preferably comprised at a level of 0-60%, more preferably 0-30% of the entire composition. When no propellant is used, the hair mousse composition is usually provided in a package equipped with an air or gas mixing device.

Non-limiting examples of propellants useful in the present invention are: fluorohydrocarbons such as difluoroethane 152a (supplied by DuPont), dimethyl ether, carbon dioxide, nitrogen, and hydrocarbons such as propane, iso-butane, n-butane, and mixtures of hydrocarbons such as LPG (liquefied petroleum gas).

When used with a propellant, the components usually must be contained under pressure in a suitable vessel, such as a pressed dispensing package which is well known in the art (for example, a package for Vidal Sassoon Styling Mousse Extra Body/ The Procter & Gamble Company).

Optional componets

Optional components can be included in the foaming cosmetic compositions of the present invention, depending on the needs of the product. Non-limiting examples of such optional components include additional surfactants, ultraviolet and infrared screening and absorbing agents, hair conditioning agents, skin conditioning agents, perfume, color, pH adjusters, polymers, dyes, vitamins, proteins, plant extracts, and nutrients.

A foaming cosmetic composition such as a hair mousse compositions can comprise a polymer for hair styling and conditioning, and a preservative, and can further comprise other optional components.

Polymer

A foaming cosmetic composition such as a hair mousse compositions may further comprise a polymer. Such polymer comprise cationic, nonionic, anionic, and amphoteric polymers. Polymer is typically included by weight at a level of 0-15%, preferably 0-10% of the concentrate.

Polymers suitable for use herein include any polymers soluble or colloiddally dispersible in the aqueous phase (if water is the only solvent in the aqueous phase, the polymer should be soluble or dispersible in water; if an optional cosolvent such as ethanol is present the polymer should be soluble or dispersible in the combined solvent system). Solubility/dispersibility is determined at ambient conditions of temperature and pressure (25°C at 1At). Polymers for use in the compositions of the present invention include cationic, anionic, nonionic, and amphoteric resins.

Non-limiting examples of cationic polymers useful in the present invention include quaternized cellulose ethers such as Polyquaternium 10 (hydroxyethylcellulose hydroxypropyl trimethylammonium chloride ether) under the trade name Ucare Polymer LR and Polyquaternium 4 (hydroxyethylcellulose dimethyldiallyl ammonium chloride copolymer) under the trade name Celquat, quaternized vinyl pyrrolidone/alkylaminoacrylate or methacrylate copolymers such as Polyquaternium 11 (polyvinylpyrrolidone N,N'-dimethylaminoethylmethacrylic acid copolymer diethyl sulfate salt) under the trade name Gafquat, methylvinylimidazolium vinylpyrrolidone quaternary ammonium copolymers commercially available under the trade name Luviquat, vinylmethyl ether ethyl maleate copolymer (PVM/MA copolymer), PVP/VA copolymer under the trade name Luviskol, polyvinyl alcohol, copolymers of polyvinylalcohol and crotonic acid, copolymers of polyvinylalcohol and maleic anhydride, hydroxypropyl cellulose, hydroxypropyl guar gum, sodium polystyrene sulfonate, polyvinylpyrrolidone ethylmethacrylate methacrylic acid terpolymer, octylacrylamide acrylate butylaminoethyl methacrylate copolymers, and mixtures thereof.

Other examples of cationic polymers are cationic guar gums, for example, hydroxypropyltrimethylammonium guar gum, quaternized cellulose ethers such as copolymers of hydroxyethylcellulose with diallyldimethyl ammonium chloride or with trimethyl ammonium substituted epoxides, homopolymers of lower alkylamino alkyl acrylate or methacrylate monomers (e.g. dimethyl aminoethylmethacrylate) and copolymers thereof with compatible monomers such as N-vinylpyrrolidone or with methacrylate derivatives such as methyl, ethyl, abietyl and oleyl methacrylates and mixtures thereof and/or with alkyl acrylates such as methyl and butyl acrylates and mixtures thereof, copolymers of dimethyldiallyl ammonium chloride and acrylamide, homopolymers of dimethyldiallyl ammonium chloride, vinylimidazolium/vinyl pyrrolidone copolymers, and mixtures thereof.

Polycationic hair conditioning polymers can be derived from polymerizable cationic starting monomers, or from polymerizable nonionic monomers which are modified subsequent to polymerization to be of cationic character.

Examples of the cationic monomers include:

- (i) monomers derived from acrylic acid or methacrylic acid, which is referred to hereinafter collectively as (meth)acrylic acid, and a quaternized epihalohydrin product of a trialkyl amine having 1 to 5 carbon atoms in the alkyl group such as (meth)acryloxypropyltrimethylammonium chloride and (meth)acryloxypropyltriethylammonium bromide;
- (ii) amine derivatives of (meth)acrylic acid or amine derivatives of (meth)acrylamide derived from (meth)acrylic acid or (meth)acrylamide and a dialkylalkanolamine

have C₁-C₄ alkyl groups such as dimethylaminoethyl (meth)acrylate, diethylaminoethyl (meth)acrylate, dimethylaminopropyl (meth)acrylate, or dimethylaminopropyl (meth)acrylamide; and

- (iii) derivatives of the products of the group (ii) above by (1) neutralization with an inorganic or organic acid, such as hydrochloric acid, or lactic acid, (2) modification with a halogenated alkyl, such as methyl chloride, ethyl chloride, methyl bromide, or ethyl iodide, (3) modification with a halogenated fatty acid ester such as ethyl monochloroacetate, or methyl monochloropropionate, and (4) modification with a dialkyl sulfate such as dimethyl sulfate, or diethyl sulfate.

Furthermore, the cationic unsaturated monomers include amine derivatives of allyl compounds such as diallyldimethylammonium chloride and the like as well as vinylimidazolium quaternary ammonium monomers.

These cationic unsaturated monomers can be polymerized in cationic form, or as an alternative they can be polymerized in the form of their precursors, which are then modified to be cationic, for example, by a quaternizing agent (eg. ethyl monochloroacetate, dimethyl sulfate, etc.)

Non-limiting examples of nonionic monomers are acrylic or methacrylic acid esters of C₁-C₂₄ alcohols, such as methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, 2-methyl-1-propanol, 1-pentanol, 2-pentanol, 3-pentanol, 2-methyl-1-butanol, 1-methyl-1-butanol, 3-methyl-1-butanol, 1-methyl-1-pentanol, 2-methyl-1-pentanol, 3-methyl-1-pentanol, 1-butanol, cyclohexanol, 2-ethyl-1-butanol, 3-heptanol, benzyl alcohol, 2-octanol, 6-methyl-1-heptanol, 2-ethyl-1-hexanol, 3,5-dimethyl-1-hexanol, 3,5,5-trimethyl-1-hexanol, 1-decanol, 1-dodecanol, 1-hexadecanol, 1-octadecanol, and the like, the alcohols having from about 1-24 carbon atoms; styrene; chlorostyrene; vinyl esters such as vinyl acetate; vinyl chloride; vinylidene chloride; acrylonitrile; alpha-methylstyrene; t-butylstyrene; butadiene; cyclohexadiene; ethylene; propylene; vinyl toluene; alkoxyalkyl (meth)acrylate, such as methoxy ethyl (meth)acrylate and butoxyethyl (meth)acrylate; and mixtures thereof. Other nonionic monomers include acrylate and methacrylate derivatives such as allyl acrylate and methacrylate, cyclohexyl acrylate and methacrylate, oleyl acrylate and methacrylate, benzyl acrylate and methacrylate, tetrahydrofurfuryl acrylate and methacrylate, ethylene glycol di-acrylate and -methacrylate, 1,3-butyleneglycol d-acrylate and -methacrylate, diacetoneacrylamide, isobornyl (meth)acrylate, and the like.

Non-limiting examples of polar nonionic monomers include acrylamide, N,N-dimethylacrylamide, methacrylamide, N-t-butyl acrylamide, methacrylonitrile, acrylamide, acrylate alcohols (eg. C₂-C₆ acrylate alcohols such as hydroxyethyl acrylate, hydroxypropyl acrylate), hydroxyethyl methacrylate, hydroxypropyl methacrylate, vinyl pyrrolidone, vinyl

ethers, such as methyl vinyl ether, acyl lactones and vinyl pyridine, allyl alcohols, vinyl alcohols and vinyl caprolactam.

Non-limiting examples of polycationic polymers include cationic polysaccharides, homopolymers of dimethyldiallyl ammonium chloride, copolymers of dimethyldiallyl ammonium chloride and acrylamide, cationic amino-functional homopolymers and copolymers derived from acrylic acid and/or methacrylic acid, especially from alkylaminoalkyl acrylate and methacrylate monomers such as dimethylaminoethyl acrylate and methacrylate, polyalkylene imines and ethoxy polyalkylene imines, vinylimidazolium/vinylpyrrolidone quaternary ammonium copolymers, and mixtures thereof.

Non-limiting examples of amphoteric polymers include N-methacryloyl ethyl-N,N'-dimethyl ammonium gamma-N-methyl carboxy betaine butyl methacrylate copolymer which is sold under the trade name Yukafomer AM-75; Octylacrylamide/Acrylates/Butylaminoethyl Methacrylate Copolymer which is sold under the trade name Amphomer 4910; and Octylacrylamide/Hydroxypropyl Acrylates/Butylaminoethyl Methacrylate Copolymer which is sold under the trade name Amphomer LV-71.

Non-limiting examples of anionic polymers include the anionic, i.e. salt-neutralized forms of the following: VA/Crotonates/Vinyl Neodecanoate Copolymer which is sold under the trade name Resyn 28-2930; VA/Crotonates Copolymer which is sold under the trade name Resyn 28-1310; Terpolymer of t-butylacrylate, ethylacrylate and methacrylic acid which is sold under the trade name Luvimer 100P; Acrylates/Octylacrylamide Copolymer which is sold under the trade name Dermacryl 79. Non-limiting examples of bases suitable for forming the salt-neutralized forms of these copolymers include sodium hydroxide, potassium hydroxide, ammonium hydroxide, triethanolamine, trimethylamine, and 2-amino-2-methyl-1-propanol.

Preservative

Hair mousse compositions can further comprise a preservative. Such preservative is preferably included at a level of 0-5%, more preferably 0-3% of the concentrate.

Non-limiting examples of preservatives useful in the present invention are DMDM Hydantoin (dimethylol dimethyl hydantoin) Kathon CG, (mixture of methylchloro-isothiazolinone and methyl isothiazolinone), imidazolidinyl urea, phenoxyethanol, EDTA and its salts, benzyl alcohol, and parabens such as methyl paraben, propyl paraben, butyl paraben, and LiquaPar oil (mixture of isobutyl paraben, isopropyl paraben, and butyl paraben).

Other Optional Components

Hair mousse compositions can further comprise additional surfactants. Such additional surfactants comprise nonionic, cationic, anionic, and other amphoteric surfactants which do not affect the foaming agent of the present invention. Non-limiting examples of such additional surfactants include sodium cocoyl isethionate (sodium cocoyl ethyl ester sulfonate), isosteareth 10, polyoxyethylene alkyl ether, and Geropon TC-42 (Na-N-cocoyl N-methyl taurate); lauric acid dimethanolamide. Additional surfactant is typically included at a level of less than 50%, preferably less than 33% of the foaming agent.

Hair mousse compositions may further comprise a variety of optional components. Such optional components include; thickeners and viscosity modifiers such as diethanolamides of long chain fatty acids, sodium chloride, and sodium sulfate, hair conditioning agents such as cetyl alcohol, stearyl alcohol, oleyl alcohol, and panthenol, ultraviolet absorbing agents such as octyl salicylate, pH adjusting agents such as citric acid, succinic acid, sodium hydroxide and triethanolamine, coloring agents, hair oxidizing agents such as hydrogen peroxide, perborate salts and persulfate salts, hair reducing agents such as thioglycolates, perfumes, perfume solubilizing agents such as polyethylene glycol fatty acid esters, sequestering agents, polymer plasticizing agents such as glycerin and propylene glycol, and volatile and non-volatile silicone fluids. Such optional ingredients are typically included at a level of 0.01-20%, preferably from 0.01-10% of the concentrate.

EXAMPLES

The following examples illustrate the compositions of the present invention, but are not intended to be limiting thereof. All percentages and ratios are described as active levels.

TABLE 1

COMPONENT	AMOUNT (%)			
	COMPOSITION NO.			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Concentrate	92.0	94.0	93.0	95.0
Propellant L.P.G.	8.0	6.0	7.0	5.0
Total of Composition	100.0	100.0	100.0	100.0
COMPONENTS IN CONCENTRATE				
Cocamidopropyl Betaine ^{*1}	0.60	0.15	-	-
Cocamidopropyl Hydroxysultaine ^{*2}	-	-	0.20	0.20
Lauryl Betaine ^{*3}	-	0.10	-	0.05
Disodium Cocoamphodipropionate ^{*4}	-	-	0.05	-
Sodium Cocoyl Sarcosinate ^{*5}	0.05	-	-	0.30
Sodium N-cocoyl N-methyl β Aminopropionate ^{*6}	-	-	0.02	0.05
Sodium N-lauroyl N-methylaminopropionate ^{*7}	-	0.45	-	0.05
Isosteareth 10 ^{*10}	-	-	0.02	-
Lauramide DEA ^{*11}	-	-	-	-
Polyquaternium 4	1.00	-	-	2.00
Polyquaternium 7	-	-	1.20	-
Polyquaternium 11	-	0.30	-	-
Ethyl ether of PVM/MA copolymer	-	-	0.80	-
Ethanol	-	0.30	5.00	5.00
Methyl Paraben	0.10	0.15	0.15	0.10
Propyl Paraben	0.10	0.05	0.05	0.10
Phenoxyethanol	0.25	0.15	0.15	0.25
Disodium EDTA	0.10	0.10	0.10	0.10
Dimethicone Copolyol	-	0.17	-	-
Perfume	0.08	0.10	0.05	0.08
Propylene Glycol	0.10	-	0.25	0.10
DI Water	q.s.	q.s.	q.s.	q.s.
Total of Concentrate	100	100	100	100

14
TABLE 2

COMPONENT	AMOUNT (%)		
	<u>COMPOSITION NO.</u>		
	<u>5</u>	<u>6</u>	<u>7</u>
Concentrate	91.0	94.0	100.0
Propellant L.P.G.	9.0	6.0	0.0
Total of Composition	100.0	100.0	100.0
COMPONENTS IN CONCENTRATE			
Cocamidopropyl Betaine ^{*1}	0.05	0.05	0.50
Lauryl Betaine ^{*3}	-	0.05	0.10
Disodium cocamphodipropionate ^{*4}	-	0.05	-
Sodium Cocoyl Sarcosinate ^{*5}	0.15	-	-
Sodium N-cocoyl N-methyl β Aminopropionate ^{*6}	-	0.15	0.05
Sodium Cocoamphohydroxypropylsulfonate ^{*7}	-	0.02	-
Sodium Cocoyl Isethionate ^{*9}	-	0.02	-
Isosteareth 10 ^{*10}	-	0.02	-
Lauramide DEA ^{*11}	-	0.02	-
Polyquaternium 7	0.50	-	-
Polyquaternium 10	0.50	-	-
Polyquaternium 11	-	-	3.00
PVP/VA Copolymer	0.25	2.00	-
Ethyl ether of PVM/MA copolymer	0.25	1.00	-
Ethanol	3.00	4.00	10.00
Methyl Paraben	0.10	0.10	0.10
Propyl Paraben	0.10	0.10	0.10
Phenoxyethanol	0.25	0.25	0.25
Disodium EDTA	0.10	0.10	0.10
Dimethicone Copolyol	0.10	0.10	-
Perfume	0.05	0.05	0.10
Propylene Glycol	0.10	0.10	0.20
DI Water	q.s.	q.s.	q.s.
Total of Concentrate	100	100	100

- *1 Active of TEGO BETAINE S (30% solution).
- *2 Active of REWOTERIC AM CAS (50% solution).
- *3 Active of REWOTERIC AM DML-35 (35% solution).
- *4 Active of AMPHOTERGE K-2 (70%).
- *5 Active of SOYPON SCE (30% solution).
- *6 Active of ALANON ACE (30% solution).
- *7 Active of MIRANOL CS CONC. (45% solution).
- *8 Active of ALANON ALE (30% solution).
- *9 Active of DIAPON CI-R. (90% powder).
- *10 Active of AROSURF 66 E10 (100% solid).
- *11 Active of STANDAMID LDS-RV (30% solution).

Comparison of the Foam Rheology

The foaming rheology of a foaming composition of the present invention (composition 8) against compositions A (as being example of the composition of co-pending U.S. application serial No. 08/154231), B (0.6% by weight of Cocamidopropyl Betaine) and C (0.05% by weight of Sodium Cocoyl Sarcosinate), measured by using the Cam-Med CSL 100 Controlled stress rheometer (Cam-Med Ltd., England), under the following conditions.

Conditions: Parallel flat plate, Upper plate 6cm flat.
Flow mode, Mousse foam (ping pong ball size) dispensed into the center of the lower plate.
Fast compression to plate gap of 3mm = 10cm/sec.
Slow compression (2mm) to plate gap of 1mm = 0.5mm/sec.
The gap between two plates is 1mm.
The time between foam dispensing and commencement of measurement is no more than 10 seconds

TABLE 3

COMPONENT	AMOUNT (%)			
	<u>COMPOSITION NO.</u>			
	<u>8</u>	<u>A</u>	<u>B</u>	<u>C</u>
Concentrate	92.0	94.0	94.0	94.0
Propellant L.P.G.	8.0	6.0	6.0	6.0
Total of Composition	100	100	100	100
COMPONENTS IN CONCENTRATE				
Cocamidopropyl Betaine ^{*1}	0.6	0.2	0.6	-
Lauramine Oxide ^{*2}	-	0.2	-	-
Sodium Lauroyl Sarcosinate ^{*3}	0.05	-	-	0.05
Polyquaternium 4	1.00	1.00	1.00	1.00
Methyl Paraben	0.15	0.15	0.15	0.15
Phenoxyethanol	0.25	0.25	0.25	0.25
Disodium EDTA	0.10	0.10	0.10	0.10
Dimethicone Copolyol	0.17	0.17	0.17	0.17
Dimethicone	0.83	0.83	0.83	0.83
Perfume	0.05	0.05	0.05	0.05
Propylene Glycol	0.10	0.10	0.10	0.10
DI Water	q.s.	q.s.	q.s.	q.s.
Total of Concentrate	100	100	100	100

*1 Active of TEGO BETAINE F (30% solution).

*2 Active of AMMONYX LO (30% solution).

*3 Active of SOYPON SCE (30% solution).

The Fig.1 shows the result of the comparison of the foaming rheology of the composition 8 of the present invention and comparative examples A, B and C. In Fig.1, the vertical axis shows shear stress (Pa of Nm^{-2}) and represents foam stiffness, and the horizontal axis shows shear rate (1/S) and represents foam breakability.

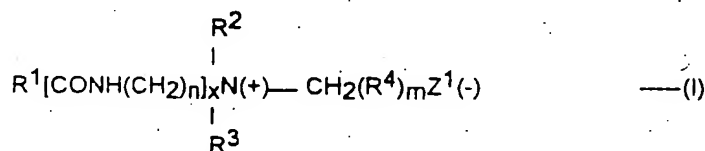
As the result, composition 8 in Fig.1 shows similar rheology to comparative example A, and better foam rheology compared to comparative examples B and C.

The compositions shown in Tables 1, 2 and 3 can be prepared by any conventional method well known in the art. A suitable method is as follows:

Polymers and preservatives are added into distilled water under agitation at room temperature. The obtained mixture is heated up to 70-75°C until homogenized. Other optional components are added to the heated mixture, and agitated until homogenized. The obtained mixture is allowed to cool to 30-40°C, and amphoteric surfactant, N-acyl acid surfactant, perfume and other heat sensitive components are added. The obtained concentrate is packed into cans with propellant.

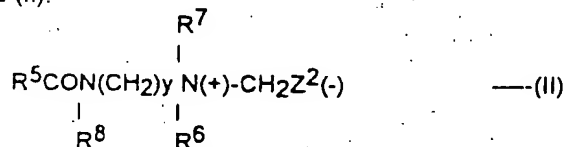
We Claim:

1. A foaming agent for use in a foaming cosmetic composition which foams by being dispensed or sprayed, comprising an amphoteric surfactant and an N-acylamino acid anionic surfactant and salts thereof.
2. A foaming agent for use in a foaming cosmetic composition which foams by being dispensed or sprayed, comprising:
 - (1) an amphoteric surfactant selected from the group consisting of general formula (I):



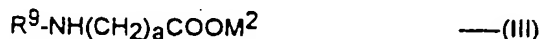
wherein R¹ is an alkyl, alkenyl, aryl, or hydroxyalkyl radical of from about 8 to about 22 carbon atoms, optionally interrupted with up to about 10 ethylene oxide moieties and/or 1 glyceryl moiety, R² and R³ are individually selected from alkyl and monohydroxyalkyl groups containing from about 1 to about 3 carbon atoms, R⁴ is alkylene, or hydroxyalkylene of from about 1 to about 4 carbon atoms, Z¹ is a radical selected from carboxylate, sulfonate, sulfate, phosphate, or phosphonate, x is 0 or 1, n is from about 1 to about 6, and m is 0 or 1;

general formula (II):



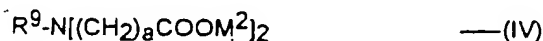
wherein R⁵ is C₈-C₂₂ alkyl, alkenyl, aryl, or hydroxyalkyl, R⁶ is hydrogen or CH₂CO₂M¹, R⁷ is CH₂CH₂OH or CH₂CH₂OCH₂CH₂COOM¹, R⁸ is hydrogen, CH₂CH₂OH, or CH₂CH₂OCH₂CH₂COOM¹, Z² is CO₂M¹ or CH₂CO₂M¹, y is 2 or 3, M¹ is hydrogen or a cation, such as alkali metal, alkaline earth metal, ammonium, alkanol ammonium, sulfate, sulfonate, phosphate, or phosphonate;

general formula (III):



wherein a is a number from 1 to 4, R⁹ is C₈-C₂₂ alkyl, alkenyl, aryl, hydroxyalkyl or alkylamidoalkyls, and M² is hydrogen, alkali metal, alkaline earth metal, ammonium or alkanolammonium;

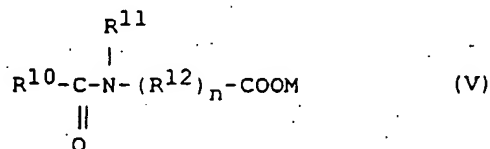
general formula (IV):



wherein a is a number from 1 to 4, R⁹ is C₈-C₂₂ alkyl, alkenyl, aryl, hydroxyalkyl or alkylamidoalkyls, and M² is hydrogen, alkali metal, alkaline earth metal, ammonium or alkanolammonium;

and mixtures thereof; and

(2) an N-acylamino acid anionic surfactant and salts thereof selected from the group consisting of general formula (V);



wherein: R¹⁰ is a C₈-C₂₄ alkyl or alkenyl radical, preferably C₁₀-C₁₈ alkyl; R¹¹ is -H, C₁-C₄ alkyl, phenyl, or -CH₂COOM, preferably C₁-C₄ alkyl, more preferably C₁-C₂ alkyl; R¹² is -CR¹³₂- or C₁-C₂ alkoxy, wherein each R¹³ independently is -H or C₁-C₆ alkyl or alkylester, and n is from 1 to 4, preferably 1 or 2; and M is -H or a soluble salt-forming cation;

and mixtures thereof.

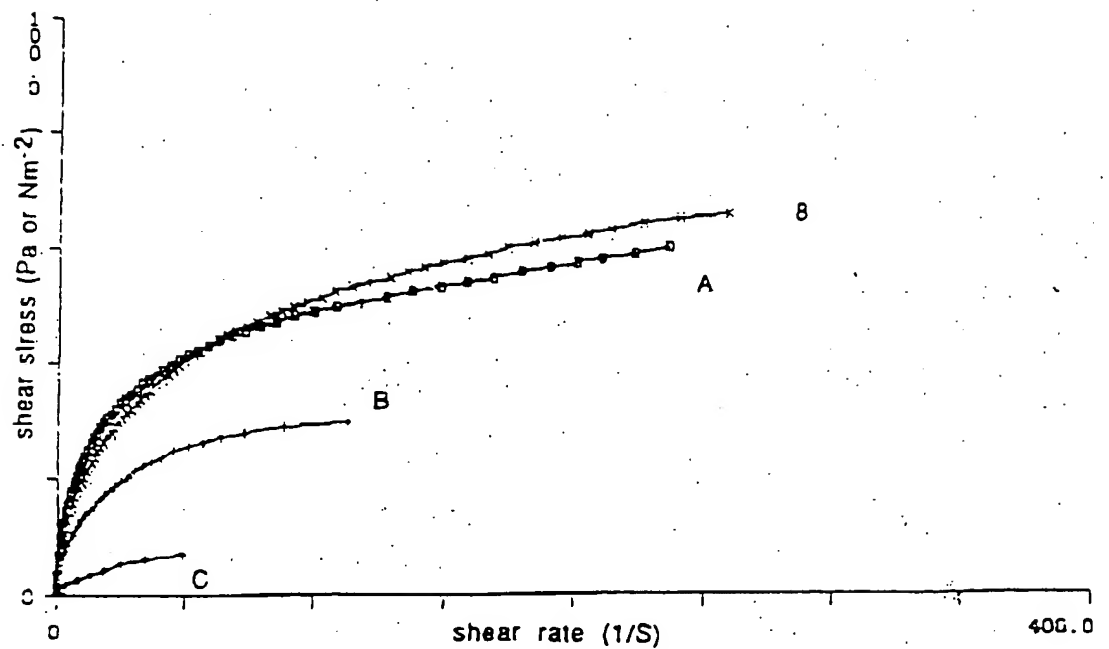
3. The foaming agent useful for foaming cosmetic compositions according to Claim 2 wherein said amphoteric surfactant is selected from the group consisting of general formula (I), (II), and mixtures thereof.
4. A foaming cosmetic compositions comprising the foaming agent according to claim 2 wherein said composition comprises 0.005-30% by weight of said amphoteric surfactant and 0.005-3% by weight of said N-acylamino acid anionic surfactant or salts thereof.
5. A hair mousse composition according to Claim 3 which foams by being dispensed or sprayed, comprising by weight:
 - i) 40-100% a concentrate, said concentrate comprising by weight:
 - a) 0.01-20% said foaming agent of claim 3; and
 - b) 60-99% a solvent; and
 - ii) 0-60% a propellant.

6. The hair mousse composition according to Claim 5 comprising by weight:
 - i) 40-100% said concentrate, the concentrate comprising by weight:
 - a) 0.01-10% said foaming agent;
 - b) 80-99% said solvent ;
 - c) 0-15% a polymer which is cationic, nonionic, anionic, amphoteric or mixture thereof; and
 - d) 0-5% a preservative; and
 - ii) 0-60% said propellant.
7. The hair mousse composition according to Claim 6 comprising by weight:
 - i) 70-100% said concentrate, the concentrate comprising by weight:
 - a) 0.01-6% said foaming agent comprising betaine, and N-acylamino acid amionic surfactant or salts thereof;
 - b) 85-98% said solvent; and
 - c) 0-15% a polymer which is cationic, nonionic, anionic, amphoteric or mixture thereof; and
 - d) 0-3% said preservative; and
 - ii) 0-30% said propellant.
8. The hair mousse composition according to Claim 5 wherein said solvent is selected from the group consisting of water and polyhydric alcohol.
9. The hair mousse composition according to Claim 6 wherein said solvent is selected from the group consisting of water and polyhydric alcohol.
10. The hair mousse composition according to Claim 7 wherein said solvent is selected from the group consisting of water and polyhydric alcohol.
11. The hair mousse composition according to Claim 5 wherein said propellant is a hydrocarbon.
12. The hair mousse composition according to Claim 6 wherein said propellant is a hydrocarbon.
13. The hair mousse composition according to Claim 7 wherein said propellant is a hydrocarbon.

-21-

14. The hair mousse composition according to Claim 5 wherein said preservative is selected from the group consisting of parabens, phenoxyethanol, and EDTA and its salts.

1/1



B: 0.6% Cocamidopropyl Betaine and 0.05% Sodium Cocoyl Sarcosinate (present invention)

A: 0.2% Cocamidopropyl Betaine and 0.2% Lauramine Oxide

B: 0.6% Cocamidopropyl Betaine

C: 0.05% sodium Cocoyl Sarcosinate

FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US95/16050

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : A51K 7/075; B01F 17/28.

US CL : 252/90, 305, 307, 356; 424/45, 47, DIG. 1.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 252/90, 305, 307, 356; 424/45, 47, DIG. 1.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 5,217,652 (IOVANNI) 08 June 1993 (08-06-93)	1-4
Y	examples 1 and 2.	-----
Y	US, A, 4,526,781 (GOLDBERG ET AL) 02 July 1985 (02-07-85) example 13.	5-14
A	US, A, 4,713,182 (HILTZ ET AL.) 15 December 1987 (15-12-87) example 2.	5-14

☐

Further documents are listed in the continuation of Box C.

☐

See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G*	document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means		
P document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

02 APRIL 1996

Date of mailing of the international search report

11 APR 1996

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Authorized officer

RICHARD D. LOVERING aco

Facsimile No. (703) 305-3230

Telephone No. (703) 308-1235

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☒ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.